

12. The Vlora wetlands

Summary

Vlora, the most southern district in the Western Adriatic Coastal Lowland, holds about 150 km of coastline. It borders on both the Ionian and the Adriatic coast. Along these a transitional wetland continuum has been established extending from the Shkumbini delta in the north to the Vlora town in the south. The Vjosa-Narta region comprises the largest and the most important coastal wetlands of Albania. Of the plain area of 194 km², 96 km² are wetlands, including the Narta lagoon (59 km²), the Vjosa delta (33 km²), the Kallenga Lake (28 km²), the Salty Lake (0.6 km²) and the Dajlani Cape marsh (0.3 km²). At present about 33% of the region are agricultural land. The Vjosa-Narta area has been declared as landscape protected area (197 km²; V category; see Tab. 5-4) in 2004.

The Rreza-Karaburuni peninsula (200 km²; IV) comprising also Orikumi wetland (8 km²) is protected and carries the status of a natural managed reserve (started 1966 and reactivated 1986). The Llogora national park (II), founded in 1966, is a forest area of about 10 km². Finally in 2010 Karaburuni-Sazani (Vlora) (126 km²) has been declared a marine national park (II).

12.1. How to reach the area

Vlora is a coastal town (Fig. 12-1 and 12-3) with 120'000 inhabitants situated just where the Adriatic meets the Ionian Sea, close to the channel of Otranto. Ferries connect Vlora with Italy and Greece. Vlora offers many possibilities for accommodation and is a most fascinating site in summer. It is a good starting point for visiting the many wetlands.

Figure 12-1: Map of the transitional wetlands of the Narta and Vjosa delta (Vlora district) with the main inhabited centers, habitats and roads (red) (Google Imagery, 2008, modified).



12.2. Information about the most important sites

The Narta lagoon is situated about 14 km north of Vlorë. Together with the Dajlani Cape marsh, the Salty lagoon, the Kallenga lagoon and the coastal dunes these sites are all reached on rural roads from the national road from Fieri to Vlorë at Akerni or Mifoli village. They lead the visitors also to the Vlorë part of the Vjosa delta, the Poro forest and the dunes. The whole Vjosa-Narta complex belongs to the landscape protected areas and is of international importance as it fulfills the Ramsar criteria for the total number of wintering waterbirds.

Besides the many wetland and natural reserve sites along the coast, many cultural and historic sites in the region are worth to be visited. The town of Vlorë, known in antiquity as Aulona, is noted since the 2nd century BC as a port and town at the Adriatic Sea. In the history of Albania, Vlorë was the site of the proclamation of the Independence from Ottoman Empire in 1912.



Figure 12-2: Wooden pedestrian bridge leading to the monastery of Saint Mary, and the cypress forest on the Zverneçi Island, Narta lagoon (Photo: S. Beqiraj).

The big monument as witness of the independence has been built in 1972 in the center of the town at the Flag Square (Fig. 12-4). Close to the harbor we find the Museum of Independence where Ismail Qemali announced the independence of the country on November 28th 1912. There he raised the national flag and constituted the Government of the new Albanian State. The Kusum Baba hill offers a bright view on Vlorë town and the Vlorë bay. The historical museum with hundreds of authentic artifacts from different historic periods, the archaeological museum and the ethnographic museum are worth to visit. The Lead or Muradie Mosque, designed by the famous architect Sinani of the Ottoman Empire from 1542 to 1557 is still in function. When visiting the Zverneci Island the monastery of Saint Mary, a typical Byzantine remainder from the 10th century, should not be forgotten (Figs. 12-2 and 12-5).



Figure 12-3: Vlorë town from the Kanina castle with the Soda forest and the new harbor (Photo: L. Kashta).

Figure 12-4: *Above left:* Monument of Independence (1972) at the Flag Square in the Vlorë main centre; *above right:* Lead or Muradie Mosque (16th century) in Vlorë. *Below left:* Museum of Independence (since 1962) near the old Vlorë Harbor; *below right:* Vlorë town from the Cold Water Riviera (Photos: S. Miho). »»»





Figure 12-5: External (*left*) and internal (*right*) view of the monastery of Saint Mary (10th century) at Zverneci island, Vlora (Photos: L. Kashta and A. Miho).

The Orikumi wetland, also called Pashalimani marsh or Dukati pond, is situated near the town of Orikumi (Figs. 12-15 and 12-16), just at the south end of the Vlora bay. The wetland is close to the military zone of Pashalimani that was heavily fortified after the 2nd World War and sheltered military submarines of the Warszawa Pact. The Archaeological Park of Oriku can be visited also in Pashalimani (Fig. 12-6). The ancient town was founded originally as a Greek colony in the 5th century BC in the territories of the Amantia Illyrian tribe; it persisted during the Roman and Ottoman periods.



Most of the ruins of old Oriku are underwater in the lagoon and in part within the Military Base needing a permission to visit. The Marmiroi church from the Byzantine period (13th century) rises on the hill at the foot of the Rreza-Karaburuni, close to the wetland area (Fig. 12-6).

The Llogora National Park (founded 1966) is a mostly forested zone of 10.2 km² about 45 km distant from Vlorë. It extends towards the Llogora pass (about 1000 m a.s.l.) with the Mount Çika (2045 m a.s.l.) and the coastal mountain chain of Rreza - Karaburuni. From the pass the visitor gets a magnificent view on the full Ionian Riviera (*see* Fig. 13-20). The crowns of the trees right on the pass are buckled by the strong south-eastern wind, known as *juga*. An Austrian pine near the pass is well-known as the Flag Pine; it is a natural monument (Fig. 12-7). The Karaburuni-Sazani marine national park is the only national marine park in Albania. It covers a belt along the coastline of the Karaburuni peninsula and the Sazani island close to the bay of Vlorë (Fig. 12-19).



Figure 12-7: The Llogora national park, Vlorë; **left:** Flag Pine (*Pinus nigra*), a natural monument (biomonument); **right:** two male individuals of fallow deer (*Dama dama*) at the tourist centre (Photos: A. Miho).

« « **Figure 12-6:** **Left:** Remains from the ancient ruins of Oriku like traces of buildings, streets and sculpted rocks. The most important monument is the theater of the 1st century BC; **right:** Marmiroi church (13th century) in Rreza-Kanalit, Oriku (Photos: L. Kashta and A. Miho).

12.3. Physico-geographical features

The Vlora part of the Vjosa delta and the Narta wetland complex are part of the plain Myzeqe of Vlora; it comprises the plains of Novosela, Akerni, Zhuke, Gryke Pisha and Poro that spread between the Vjosa delta and the Narta lagoon (Fig. 12-1 and 12-8). Large parts of this coastal zone are covered with swamps because of their low elevation above sea level.

Similar to the other coastal parts described in this book (Patogu, Lalzi, Karavasta and Semani) the Myzeqe plain rose from the end of the Pliocene and during the Quaternary and turned gradually into a continental plain. The ground is of alluvial material deposited by the river Vjosa which showed a strong sedimentation regime from the Plio-quaternary to the present, similar to most other Albanian rivers.

Like the Semani, the Vjosa runs in a very shallow bed within the plain. A slight increase in the water level provokes the river to flood or even to change its bed. The dead bed of Vjosa includes some kilometers near Zhuke and Gryke Pisha (Fig. 12-1).



Figure 12-8: Narta lagoon and the pine forest with a narrow littoral belt of coastal dunes (Photo: A. Miho).

This dynamics is illustrated by the fact that in the Roman time the town of Apollonia (see Figs. 11-5 and 11-7) was situated on a hill near the sea and close to the former bed of the river Vjosa. Today Apollonia is about 8 km away from both the river and the sea. During the wet season most of the dead meanders are filled with water forming wetlands, called 'delle'. Major morphological features of the zone are the fluvial delta of Vjosa, the sandy dunes and the Narta lagoon.

Like along the whole Albanian coast the climate is strongly influenced by the Adriatic Sea with high mean temperatures (Fig. 12-9), high sunny irradiation (1644 kWh m^{-2}) and many sunny days. Eastern and south-eastern winds dominate; about 22 days with breezes during winter are reported. The multi annual mean temperature varies between 9.2°C in January and 24.6°C in August, with an annual mean temperature of 16.5°C . The absolute minimum recorded so far is -7°C , but only for 3 to 5 days per year temperatures of zero or below are reached. The highest temperature recorded during the past 30 years is 39.5°C . The mean annual precipitation is around 1000 mm.

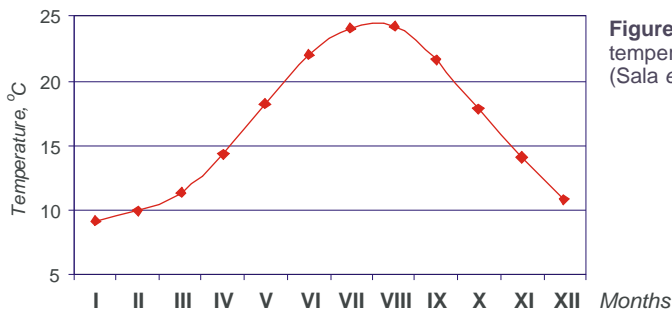


Figure 12-9: Monthly average temperatures in Vlorë (Sala *et al.*, 2006).

About 2 km south of Vlorë town at the beginning of the rocky coast more than 30 karstic springs discharge about 900 l s^{-1} of very cold water into the sea. The place is known as Cold Water (Fig. 12-10). The water is with 150 to 250 mg l^{-1} low in minerals and used as drinking water source for Vlorë town.



Figure 12-10: Cold Water coast in Vlorë with the Kanina fortress (built in the 4th and 3rd century BC) on top of the hill, 6 km south of Vlorë (Photo: L. Kashta).

12.4. Description of the most important habitats

Vjosa-Narta: The 24 km flat and sandy coast in the Vlorë region with many significant transitional habitats is divided into three main sectors, from the Vjosa mouth to the Dajlani Cape, from Vlorë (Skela) to the Treporti Cape and the Orikumi coast. The low level makes the sandy coast unstable; it changes rapidly its shape, composition and consistency. Many different habitat types are present, like the Narta lagoon, the Vjosa delta and the salt-marshes of Zhukë - Grykë Pishë (Fig. 12-1), sandy dunes, Mediterranean pine forest, the old bed of the Vjosa river and the muddy sandy plains of the Dajlani-Zverneci-Treporti cape. In the most northern part of Vjosa delta some remains of an alluvial forest and of hygrophilous vegetation are present.

The plain dominates the whole zone; the surrounding hills do not exceed 95 m in altitude. They are covered with olive-groves, pine plantations and scattered poplar plantations.

The wetland core is the Narta lagoon, a shallow marshland, surrounded by hills in the southern and western part, saline and agriculture land in the north, and two shallow wetlands in the north-west (Figs. 12-1, 12-8, 12-11 to 12-13). Other small habitats with brackish water are the Dajlani cape marsh, the Salty lagoon and the Kallenga lagoon which all extend along the marshlands from the Narta lagoon to the Vjosa Delta.

The shape of the lagoon is ellipsoid with the main axis parallel to the coast-line. The average depth is 1.3 m, the level ranges between 2.1 m and 1.1 m a. s. l. The lagoon is linked to the sea by two artificial channels; the southern one is 200 m in length and 6 to 48 m in width, while the northern one is 800 m long and 11 to 60 m wide. Massive depositions of solids from the Vjosa along the coast hamper an active water exchange between the sea and the lagoon resulting in a minimum water exchange of $1 \text{ to } 5 \text{ m}^3 \text{ s}^{-1}$. The water level hardly changes by more than a few centimeters. Some physico-chemical data about the Narta lagoon and the Saline are given in table 12-1.

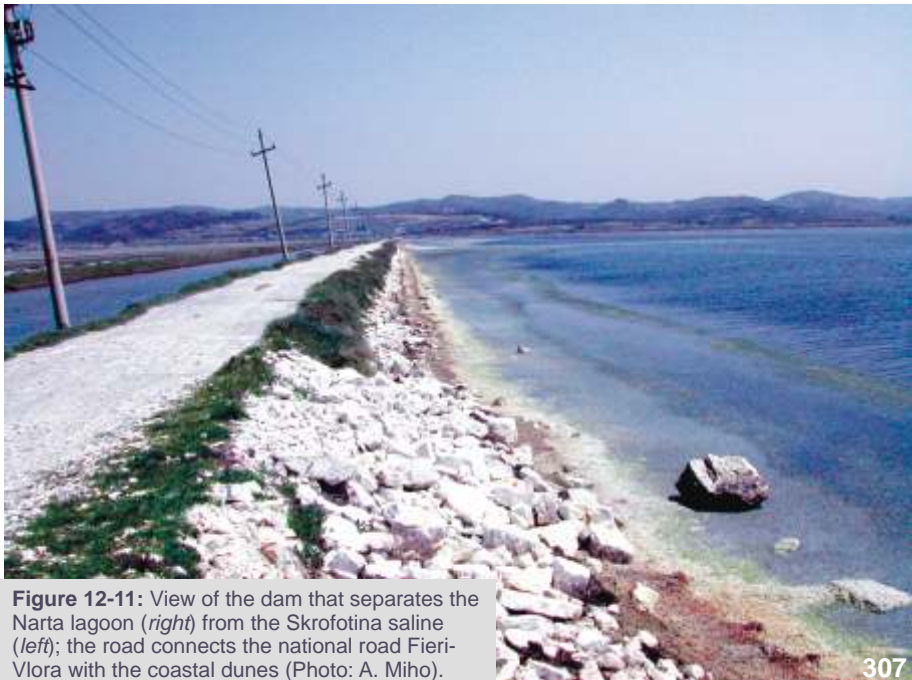


Figure 12-11: View of the dam that separates the Narta lagoon (*right*) from the Skrofotina saline (*left*); the road connects the national road Fieri-Vlora with the coastal dunes (Photo: A. Miho).



Figure 12-12: Skrofotina salt pan ponds and Akerni village at the foot of hills (Photo: A. Miho).

Table 12-1: Physico-chemical parameters from the Narta lagoon (3 stations) and from the Saline (one station) in November 2004 and April 2005 (data after INTERREG IIIB CADSES project). *t*, temperature; **Cond**, conductivity; **TDS**, total dissolved solid; **S**, salinity; **DO**, dissolved oxygen; **O₂**, oxygen.

Station	<i>t</i> (°C)	Cond (mS cm ⁻²)	TDS (g l ⁻¹)	S (‰)	DO (%)	O ₂ (mg l ⁻¹)	pH
Nov-04							
Narta	6.7	60.6	39.4	40.0	125.2	11.8	7.96
Saline	7.5	79.1	51.4	54.2	120.9	10.2	8.04
Apr-05							
Narta	16.6	45.0	29.6	29.2	83.3	6.8	8.59
Saline	24.0	71.8	47.2	49.6	161.8	9.7	9.32

The mean evaporation is estimated to be about 1270 mm per year. The mean water temperatures are between 5°C and 25°C, while the salinity varies from 28‰ to 75‰ for winter and summer, respectively. The surface area of the lagoon often decreases by 30% in summer when the access to the sea is blocked and large mudflats and salty marshes become exposed.



Figure 12-13: The south-western part of Narta Lagoon, near Zverneci village
(Photo: S. Beqiraj).

The Poro or Kallenga lagoon is situated northwest of the Narta lagoon and a shallow coastal habitat of 4.5 km². It is utilised for net fishing; a fish trap has been constructed recently in the connecting channel.

The lagoon-system is separated from the sea by the flat hills of Zverneci-Treporti and by a narrow littoral belt of coastal dunes of alluvial origin (Fig. 12-14). Their total length is about 8 km, the width between 100 to 1400 m. Pines grow on the various beaches and the rocky shore. In the western part of the lagoon a group of dunes of 5 to 6 m height and 20 to 30 m width have been declared as a natural monument (Poro dunes; Fig. 12-26). The dunes are covered with pines, cultivated about 50 years ago. The site is best approached by the rural road from the Saline to the Narta coast.

The sandy coast of Vlora extends about 8 km away from Vlora town (Skela) towards the Treporti cape in Zverneci, known as the Soda Forest. It is afforested with pines. This coastal strip is 10 to 50 m wide in the northern part but up to 2 km in the south. Sandy dunes spread in two or three parallel rows, but not in line with the coast.

The largest dunes are in Zverneci where they are half moon shaped, about 3 to 4 m high and in 400 to 500 m distance from the coast. Some old dunes are situated more on the land side, eroded and often transformed by human action. A chain of three hills, the Pllaka, Dajlani and Limoi hills of about 5 km cover the Treporti cape. They are of sandy layers of the Tortonian time (Miocene) and mixed with lime-clay formations. The hills are interlinked by sandy belts, showing their island origin. These three hills became combined and coupled with the land as the result of the large mass of solids transported by the Vjosa River.



Figure 12-14: View of the Zverneci beach and the dunes in front (Photo: O. Nika).

Two islands are located in the southern part of the lagoon with an approximate surface of 7 ha (Fig. 12-2). The larger one near Zverneci village is fully covered by a forest of Mediterranean cypress, with trees of 10 to 15 m in height and with trunk diameters of 15 to 20 cm. The forest belongs to the checklist of natural monuments. A wooden bridge links the village Zverneci to the island where the monastery of Saint Mary (10th century) is located (Fig. 12-5). The second island Karakonjishti is smaller with only a scarce vegetation cover.

The Narta coastal area has much suffered in the past from pollution by the industrial zone in Vlora. Most of these activities stopped in 1990. However in recent times, the wetlands became polluted by urban wastes of the Vlora town. High concentrations of nutrients and a poor water exchange with the sea strongly favor algal growth in the lagoon (Fig. 12-23). About the pollution with organochlorine pesticides residues in Vlora bay during 2005-10 it is reported by Nuro & Marku (2011) and discussed also in the paragraph 5.5 (see Chapter 5; Fig 5-6).

An industrial park has been constructed during the former regime some 5 km distant from Vlora and some 100 m from the coast (Fig. 12-1). The largest one was a soda-PVC complex. Due to an outdated technology the surrounding area was heavily altered and polluted by solid waste. More than 30'000 t of liquid electrolytic waste with a high content of mercury was disposed there per year during times of high production. The factory stopped in 1990 and the local government and NGOs are at present forcing the restoration and renaturation of the beach sediments.

Actually a new industrial and energy park (combined cycle thermo-power plant and hydrocarbons storage) is established in Soda Forest, close to the former industrial zone. A new Harbor, a Thermal Power Plant (600 MW) and Petrolifera (fuel storage) is working there (Fig. 12-1). Moreover, heavy urbanization is continuously spreading along the whole Vlora coastal zone from Zverneci to Orikumi. The growing amount of waste water still continues to be discharged directly into the sea, representing a great risk for the transitional habitats and the marine coastal zone.



Figure 12-15: Above: Map of the transitional area of Orikuimi (Vlora) (Google Imagery, 2008); below: Orikuimi lagoon from Rreza slopes of Karaburuni (right side) and the town (Photo: M. Xhulaj).



Orikumi: The Orikumi wetland is situated at the foot of the Rreza-Karaburuni mountain chain (Figs. 12-15 and 12-16), just at the south end of the Vlora bay. It is the principal core area of the Rreza-Karaburuni managed reserve. The wetland represents now only the remaining coastal habitat reduced in size to about 4 km². Most wetland has been reclaimed around 1970 which altered the region drastically and decreased its natural values. The former Pallarengu alluvial forest that surrounded the lagoon was transformed into agricultural land while the freshwater brook of the Dukati and some freshwater springs were captured and pumped directly to the sea. This increased massively the salinity in the lagoon. Dead tree trunks at its south-eastern shores remain as witnesses (Fig. 12-17).

The Orikumi lagoon is of tectonic origin. It has a surface area of 1.5 km² and is connected with the sea by two channels, one of artificial construction and often blocked. The gravel coast is 6 km long and 10 to 80 m wide (Fig. 12-47) and has been formed by depositions of the Dukati torrent. The water exchange with the sea is rather poor and does not ensure optimal hydrological conditions. As a consequence the average water level in the lagoon may be 15 to 60 cm higher than the sea in winter, while in summer it decreases by 15 to 35 cm below sea level.

Figure 12-16: The Orikumi lagoon and its dam
(Photo: L. Kashta).





Figure 12-17: *Above:* A topographic map of the Orikumi wetland of 1974 (Albanian Military Maps 1:25000; 1977); *left:* the southern part of the Orikumi lagoon with traces of dead trees of the former alluvial forest of Pallarengu (Photo: A. Miho).

The whole territory belongs to the municipality of Orikumi (Fig. 12-15), a town with more than 10'000 inhabitants. The population increases to 30 to 40 thousands during the summer vacation period. The wetland zone is administrated by the Department of Fishery, Ministry of Environment, Forestry and Water Administration. In addition the Ministry of Defense exploits part of the area. Some 6 km far from Orikumi, near the Tragjasi village, several karstic springs feed the Izvori, a small oligotrophic river that discharges at the Orikumi coast.

Today the part covered with freshwater continues to become reformed to the surrounding wetland of the lagoon. The former Pallarengu alluvial forest gets now restored to a marsh covered only with reed beds. It looks now as an ideal habitat for sheltering waterbirds and other aquatic animals. On the other hand the pollution risk has increased due to heavy urbanization of the Orikumi area and the rising untreated water discharge, first into the wetlands and then into the sea.

The terrestrial protected area of the Karaburuni peninsula (Fig. 12-19) was declared a natural reserve in 1966 and has since then been strictly safe guarded as a military area. This condition was reactivated in 1986 and the site declared as natural managed reserve (4th category, IUCN).

The marine national park of Karaburuni-Sazani is 16 km long with a width varying from 3 to 4.5 km. It covers in total 125 km² (Fig. 12-19). The zone includes scenic marine and coastal areas and is characterized by outstanding canyons and caves and large seagrass meadows. It comprises two natural recreational zones, two natural monuments at the tip of the peninsula, and outstanding coralligenous sites (Gryka Djallit). Several underwater archeological and historical remains are present, e.g. in the Grama bay (Fig. 12-22). Karaburuni mountain, Ravena, Orikumi and Dukati represent a buffer zone. The national park of Llogora and the Çika mountain are also comprised in this system.

The zone is characterized by a high diversity of landscapes (Figs. 12-18, 12-20 to 12-22). The rocky coastline holds steep and inaccessible cliffs, fissures, caves, small gravel beaches and bays, especially on the western slopes. Small dry river canyons descend almost vertically to the sea.



Figure 12-18: *Left:* the Sazani island from the Saint Jani bay in Karaburuni; *right:* western part of Sazani (Photos: A. Miho and L. Kashta).



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Figure 12-20: the Ionian coast of Karaburuni (Photos: L. Kashta).



« « « **Figure 12-19:** Topographic map of the terrestrial-marine protected areas of Llogora-Karaburuni-Sazani (*modified* after Kashta *et al.*, 2010).

Figure 12-21: Internal and external views of the Haxhi Alia cave, a nature monument in the Karaburuni peninsula. Below right: underwater sciaphilic communities (Photos: A. Miho and L. Kashta).

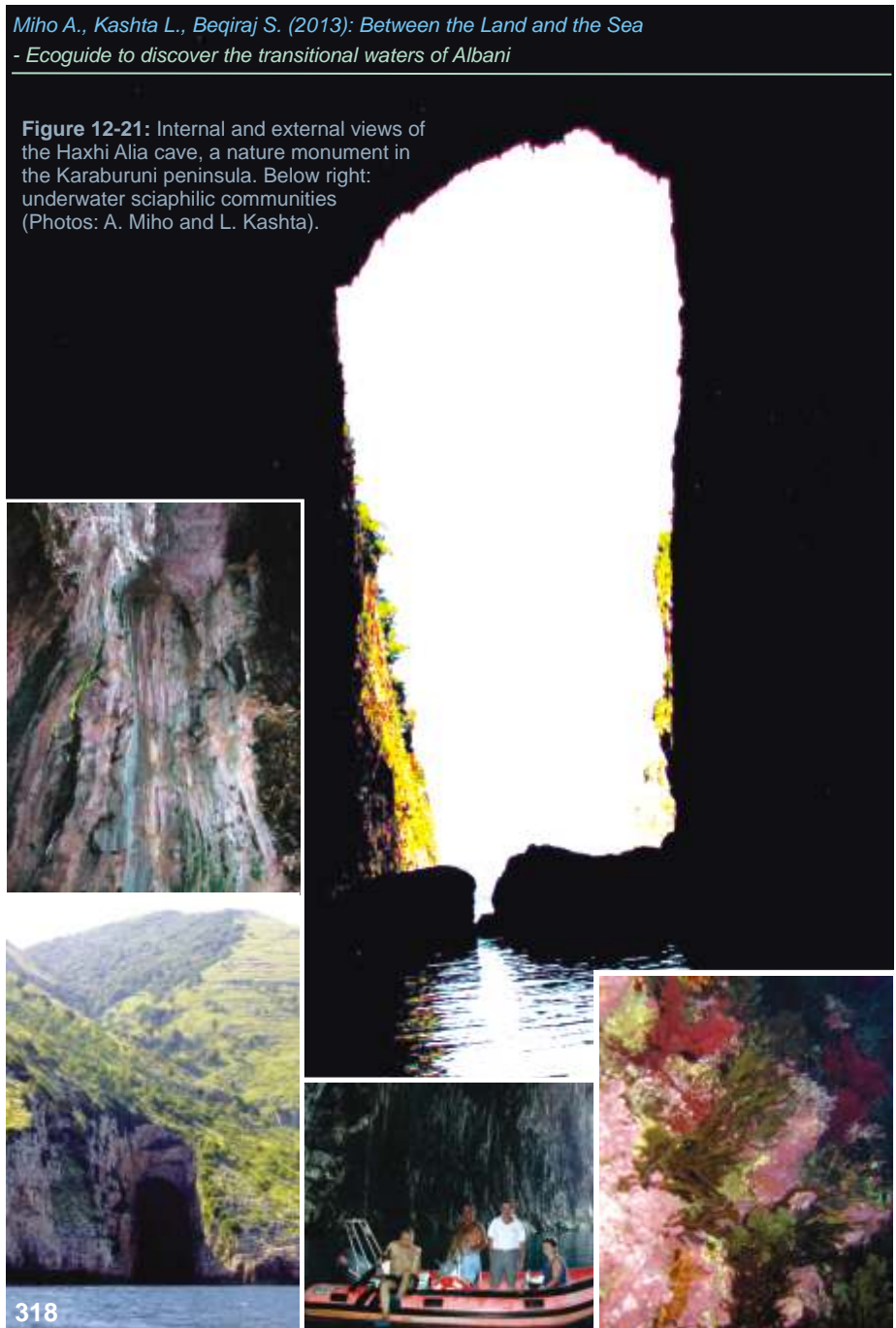




Figure 12-22: *Above:* Grama bay at the the western part of Karaburuni (nature monument);
below: old inscriptions on rocky walls of Grama bay (Photos: L. Kashta)

In spite of these nature values, the whole Karaburuni zone has been heavily impacted by fires, overgrazing, intensive hunting and military practices, especially during the last two decades of the political transition period. Recently even the construction of an Eolic park on the Karaburuni peninsula has been proposed; it would possibly be one of the largest in Europe. The zone is normally not toured by visitors as it is close to strictly controlled military areas, the most famous being the military base of Pashalimani.

12.5 Biodiversity of the Vlora wetlands

Flora

Vjosa - Narta: Many different habitats between the Vjosa delta and the Narta lagoon exhibit diverse vegetation types with a rich biodiversity.

The soft muddy substratum at the bottom of the Narta lagoon is covered by submersed meadows of *Zostera noltii*, while *Ruppia cirrhosa* grows more in shallow and protected area which often have a higher freshwater content. *Cymodocea nodosa* prospers rarely near the exchange channels to the sea. *Chaetomorpha linum*, a macrophyte alga of the benthos forming long stiff strands, grows in dense populations at depths of 0.3 to 1 m. Other macrophyte algae present belong to the genera *Ulva* and *Cladophora*, they grow excessively during spring and summer (Fig. 12-23).

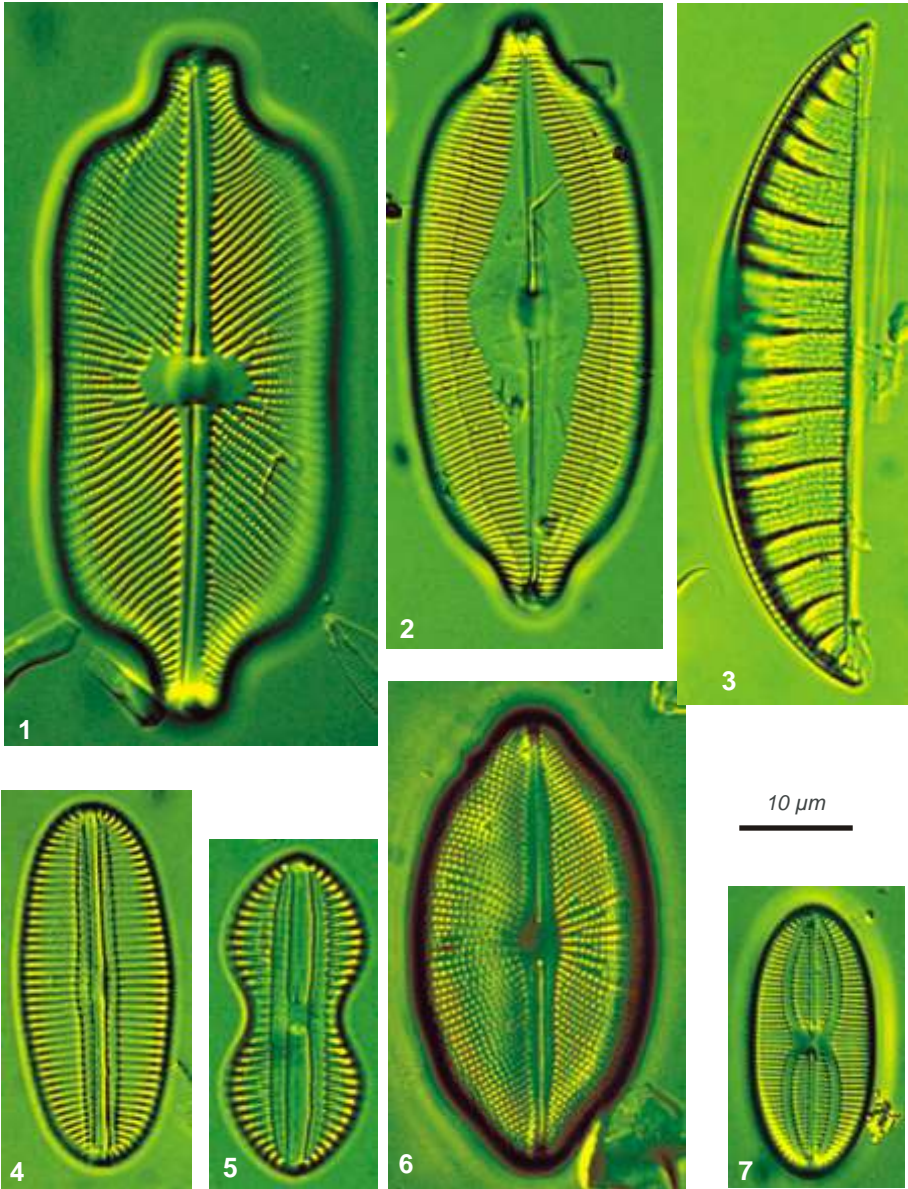
In the various wetland habitats of Narta more than 330 species of microscopic algae have been found, most of them diatoms (about 300 taxa) (Miho *et al.*, 2012). More than 95 taxa were present in the phytoplankton of the lagoon; besides a high proportion of diatoms, dinoflagellates, cryptophyceae and some filamentous cyanobacteria have been detected (Tab. 12-2). The scarce exchange with the sea and a potential high input of nutrients from Vlora town and the surrounding watershed may be the cause for the dominance of the filamentous cyanobacteria *Oscillatoria* spp., as well as for the increase of dinoflagellates of the genera *Prorocentrum* and *Dinophysis*; some of the latter, *Prorocentrum minimum* and *P. lima*, are highly toxic.



Figure 12-23: Narta lagoon from Narta village; *left*: intense growth in the lagoon of submersed macrophytes, like *Ulva* suggests a high trophic level during summer (Photos: A. Miho).

Table 12-2: Phytoplankton density (cells liter⁻¹) in the Narta lagoon between 2004 and 2007 (mean values of 4 different sites) (data after Xhulaj, 2009).

Groups	Nov-04	Apr-05	Nov-05	Apr-06	Nov-06	Apr-07
<i>Diatoms-Centricae</i>	32'500	759'900	29'900	1'042'400	127'200	214'000
<i>Diatoms-Pennatae</i>	390'800	204'100	143'000	770'500	226'100	827'700
<i>Dinophyceae</i>	280'000	305'100	147'800	734'300	263'300	425'000
<i>Cryptophyceae</i>	184'800	1'516'300	218'200	182'000	90'100	171'700
<i>Phytoflagellatae</i>	34'600	30'000	0	0	0	28'000
<i>Chrysophyceae</i>	0	0	0	0	0	0
<i>Haptophyceae</i>	0	3'700	500	4'700	0	0
<i>Cyanophyceae</i>	5'600	13'100	1'900	403'200	37'800	38'500
<i>Euglenophyceae</i>	0	2'300	200	7'000	700	0
<i>Prasinophyceae</i>	900	0	1'000	0	0	0
<i>Dictyochophyceae</i>	0	0	0	0	1'500	1'100
<i>other algae</i>	12'100	99'800	14'800	6'800	0	0
Total	941'300	2'934'300	557'300	3'150'900	746'700	1'706'000



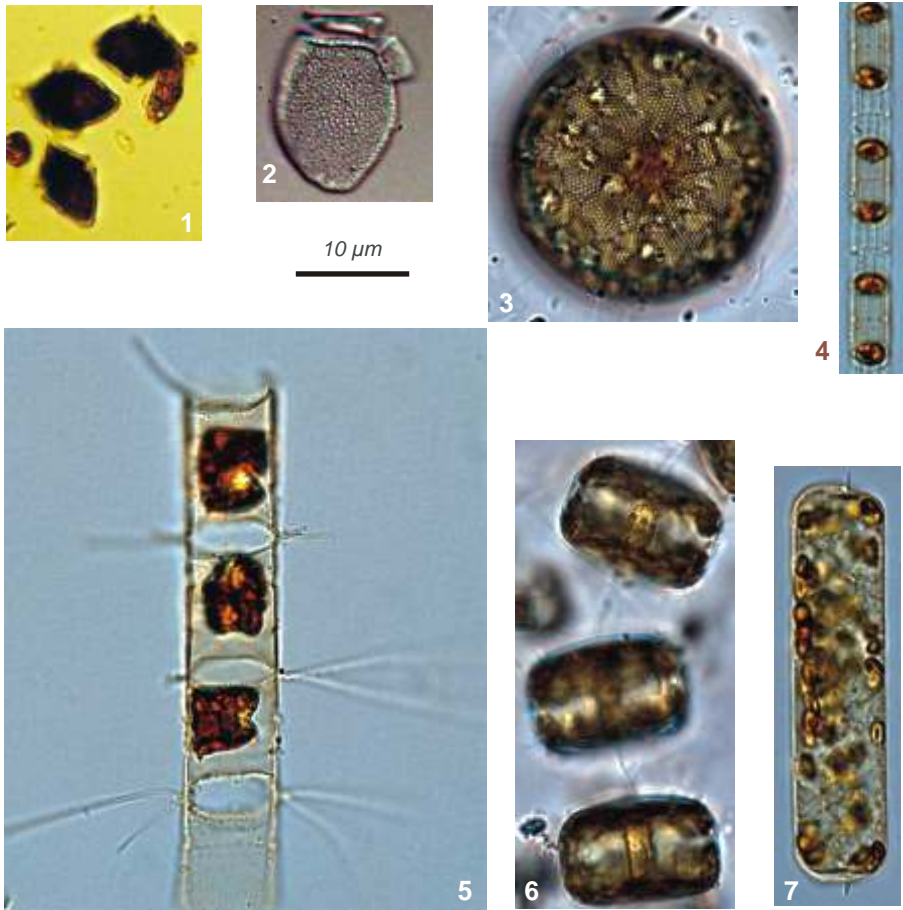


Figure 12-25: Microscopic algae from the Narta lagoon (1500x).
Dinoflagellates: 1: *Heterocapsa triquetra*; 2: *Dinophysis* sp.;
centric diatoms: 3: *Coscinodiscus radiatus*; 4: *Skeletonema costatum*;
 5: *Chaetoceros decipiens*; 6: *Thalassiosira* spp.; 7: *Dactyliosolen fragilissimus*
 (Photos: S. Xhulaj).

« « « **Figure 12-24:** Microscopic algae (pennate diatoms) from the Narta lagoon (1500x):
 1: *Petronis humerosa*; 2: *Caloneis amphisbaena*; 3: *Rhopalodia constricta*; 4: *Diploneis boldtiana*;
 5: *Diploneis interrupta*; 6: *Cosmioneis eta*; 7: *Fallacia forcipata* (Photos: S. Xhulaj).

Composition and density of the phytoplankton suggests that the lagoon is suited for extensive fishing, i.e. mullets or shrimps (*Penaeidae*). Some common and/or interesting taxa, diatoms or dinoflagellates, found either in the periphyton or phytoplankton, are illustrated in figures 12-24 and 12-25.

For the marine zone with a sandy substratum submersed meadows of *Posidonia oceanica* are characteristic at depths from 2 to 20 m (see Chapter 4). In shallow and protected zones *Posidonia* is substituted by *Cymodocea nodosa* or rarely by *Zostera noltii* as seen near the Treporti cape (Fig. 12-1). These habitats are often complemented by the green algae *Caulerpa prolifera* and *Flabella petiolata*. On rocky substrates near the Treporti cape the brown algae *Cystoseira* is more frequent, mainly *C. barbata*. Members of the genera *Acetabularia*, *Flabella*, *Anadiomene*, *Dasydadus*, *Hypnea* and *Sargassum* indicate the tropical affinity of the site. Some Atlantic influence is represented by the species *Taonia atomaria* and *Sphaerococcus coronopifolius*, while *Fucus virsoides* is an Adriatic endemic species.

More than 570 species of higher plants have been recorded in these habitats (Tab. 12-3). Interestingly about 68 higher mushrooms are listed. In table 12-4 some threatened species in the Vjosa-Narta zone are listed according to IUCN categories.

The coastal dunes and the lowlands between Vjosa delta and Vlora are of a similar character as other related habitats along the Albanian coast. Poro dunes are the most characteristic and best protected ones (Fig. 12-26). Rare or relict species that grow in the sandy dunes or in the wetlands of Vjosa delta - Narta are summarized in table 12-5. The vegetation starts with pioneer species. Gradually with increasing distance from the coastline and with higher dunes the vegetation becomes dominated by relevant dune building plants; they are listed in table 12-6.

Figure 12-3: Floristic composition (species number) of different habitats of Vjosa delta - Narta wetlands (Buzo in ADDA, 2000).

Habitats	Number of taxa
Poro (Vlora)	571
Novosela	465
Soda Pine	409
Skrofotina	487

Table 12-4: Some threatened species in the Vjosa - Narta zone according to IUCN categories; *En*, endangered; *Vu*, vulnerable.

Mushrooms	Status	Higher plants (Continued)	Status
<i>Cantharellus cibarius</i>	En	<i>Hypericum perforatum</i>	En
<i>Clathrus ruber</i>	En	<i>Juglans regia</i>	En
<i>Gyrophragmium dunalii</i>	En	<i>Laurus nobilis</i>	En
Higher plants		<i>Marsilea quadrifolia</i>	En
<i>Agrimonia eupatoria</i>	En	<i>Narcissus poeticus</i>	Vu
<i>Alnus glutinosa</i>	Vu	<i>Nuphar lutea</i>	Vu
<i>Ammophila arenaria</i>	En	<i>Nymphaea alba</i>	Vu
<i>Anacamptis morio</i> ssp. <i>caucasica</i> (=Orchis albanica)	En	<i>Nymphoides peltata</i>	Vu
<i>Anacamptis pyramidalis</i>	En	<i>Orchis coriophora</i>	En
<i>Baldellia ranunculoides</i>	Vu	<i>Orchis x paparistoi</i> (<i>Orchis albanica</i> x <i>O. coriophora</i>)	En
<i>Butomus umbellatus</i>	Vu	<i>Pancratium maritimum</i>	En
<i>Cladium mariscus</i>	Vu	<i>Quercus robur</i>	Vu
<i>Desmazeria marina</i>	En	<i>Ulmus campestris</i>	Vu
<i>Elymus farctus</i>	En	<i>Serapias lingua</i>	En
<i>Ephedra distachya</i>	En	<i>Spiranthes spiralis</i>	En
<i>Hydrocotyle vulgaris</i>	En	<i>Stachys maritima</i>	En

Table 12-5: Rare or relict species in the dunes and Narta wetlands.

Scientific name	Common name	Albanian name
<i>Anacamptis morio</i> ssp. <i>caucasica</i> (=Orchis albanica)	Albanian orchid	Salepi shqiptar
<i>Ephedra distachya</i>	Seagrape	Gjunjz
<i>Marsilea quadrifolia</i> , relict	European waterclover	Fier uhor katergjethor
<i>Narcissus poeticus</i>	Poet's daffodil	Narcisi poetik
<i>Nuphar lutea</i>	Yellow waterlily	Zambak i verdhe uji
<i>Nymphaea alba</i>	European white waterlily	Zambak i bardhe uji
<i>Nymphoides peltata</i>	Fringed waterlily	Zambak i verdhe uhor me theke
<i>Orchis</i> spp.	Orchids	Salepe
<i>Petrosimonia oppositifolia</i>		Petrosimonia
<i>Peucedanum arenarium</i>		Peucedanum
<i>Pholiurus pannonicus</i>		Foliusur
<i>Scilla</i> spp.	Squill	Bocka
<i>Senecio vernalis</i>	Eastern groundsel	Pulithi pranveror
<i>Tamarix hampeana</i>	Tamarisk	Marina



Table 12-6: Pioneer (P) and dune building plants (D).

Scientific name	Common name	Albanian name	Type
<i>Ammophila arenaria</i> ssp. <i>arundinacea</i>	European beachgrass, Marram grass	Amofile e ranishteve	D
<i>Atriplex tatarica</i> <i>A. hastata</i>	Saltbush	Laboti tartar, Laboti shigjetor	P
<i>Cakile maritima</i>	European searocket	Brokra bregdetare	P
<i>Echinophora spinosa</i>	Prickly parsnip	Ekinofora gjembake	D
<i>Elymus farctus</i>	Sand couch	Elimi	D
<i>Salsola kali</i>	Prickly saltwort	Kembekuqja	P
<i>Sporobolus pungens</i>	Coast dropseed	Sporobolusi çpues	D
326 <i>Xanthium strumarium</i> ssp. <i>italicum</i>	Rough cocklebur	Rrodhja	P

« « « **Figure 12-26:** **Above:** coastal dunes (nature monument) with European beach grass (*Ammophila arenaria*) in Poro (Narta). **Below:** Sea daffodil (*Pancreatium maritimum*), an endangered species from the coastal dunes of Poro (Photos: M. Xhulaj).

Parallel to the dune systems, the Mediterranean pine forest covers a considerable part of the zone. The forest is dominated by *Pinus maritima*, *P. pinea* and *P. pinaster*, most of them are cultivated. Among the shrubs we find again typical Mediterranean species like *Pistacia lentiscus*, *Erica manipuliflora* and *Myrtus communis*. Of special interest are rare species, such as *Orchis albanica* (= *Anacamptis morio* ssp. *caucasica*) and *Orchis x paparistoi* (*Orchis albanica* x *O. coriophora*). Close to the Poro village (Vlora), *Pinus halepensis* is most dominant. Cultivated *Pinus pinea* form an intact forest in its southern part. The Soda forest consists also of pines; in figure 12-27 fruticose and foliose lichens are depicted, found recently (April 2012) abundant in the forest. Some rare and threatened species have been detected on the Zverneci islet which is almost fully covered with an evergreen forest of *Cupressus sempervirens*, a rare phenomenon in Albania (Figs. 12-28 and 12-29). Other trees like *Quercus ilex*, *Quercus pubescens* and *Pinus* spp. grow in Zverneci island, while the shrub layer is dominated by *Myrtus communis*, *Pistacia lentiscus*, *Laurus nobilis*, *Rubus* spp., *Phillyrea angustifolia* or *Olea oleaster*.

Despite great reclaiming efforts, brackish swamps cover a large area from the Vjosa delta to the Narta lagoon where in saline habitats *Salicornia europaea* and *Suaeda maritima* grow and form stable communities.



Figure 12-27: Fruticose and foliose lichens in Soda Forest (Vlora) (Photos: O. Nika).



Figure 12-28: Zverneci island, Narta lagoon (Photo: S. Beqiraj).

In brackish water with varying salinity the plant communities shift. In the sandy plains behind the pine forest plant associations are dominated by *Saccharum ravennae* (= *Erianthus ravennae*) and *Schoenus nigricans*; they form a vegetation cover of 50 to 60%. For the local species composition see table 12-7. In abandoned fields *Lolium perenne*, *Dittrichia viscosa* and *Ranunculus velutinus* are most abundant in alluvial soil; when the soil turns dry, we find *Saccharum baldwinii* (= *Erianthus strictus*), *Dactylis glomerata* and *Aegilops triuncialis*. A hydro-hygrophilous vegetation spreads mainly along the river banks of the Vjosa and the channels in the plain. *Phragmites australis*, *Typha angustifolia*, *T. latifolia*, *Scirpus lacustris*, *S. maritimus* and *Salix* spp. are the most common species.

Table 12-7: Brackish water vegetation in Narta wetlands.

Scientific name	Common name	Albanian name	Remarks
<i>Artemisia coerulescens</i>	Sagebrush	Pelini i bruzte	saline habitats
<i>Arthrocnemum fruticosum</i>	Glasswort	Artroknemi shkurror	
<i>Arthrocnemum glaucum</i>	Glaucos glasswort	Artroknemi i rimte	
<i>Arthrocnemum perenne</i>	Perennial glasswort	Artroknemi shumevjeçar	
<i>Halocnemum strobilaceum</i>		Haloknemum	
<i>Juncus acutus</i>	Spiny rush, Sharp rush	Kulmaku i mprehte	
<i>Juncus maritimus</i>	Sea rush	Kulmaku bregdetar	
<i>Salicornia europaea</i>	Common glasswort	Jambruku evropian	
<i>Salsola soda</i>	Oppositely leaved saltwort	Cimla e sodes	
<i>Schoenus nigricans</i>	Black bogrush	Skeni zijosh	
<i>Suaeda maritima</i>	Herbaceous seepweed	Minurthi detar	varying brackish water
<i>Limonium vulgare</i>	Sea lavender	Fshesa e rendomte	
<i>Asphodelus aestivus</i>	Summer asphodel	Badhra verore	
<i>Halimione portulacoides</i>	Sea purslane	Halimioni si bordullak	
<i>Inula crithmoides</i>	Golden samphire	Omani kritmoid	
<i>Tamarix hampeana</i>	Tamarisk	Marina hampeana	sandy plains, covering 50% of the surface
<i>Erianthus ravennae</i>	Ravenna grass	Kuqela e Ravenes	
328 <i>Schoenus nigricans</i>	Black bogrush	Skeni zijosh	

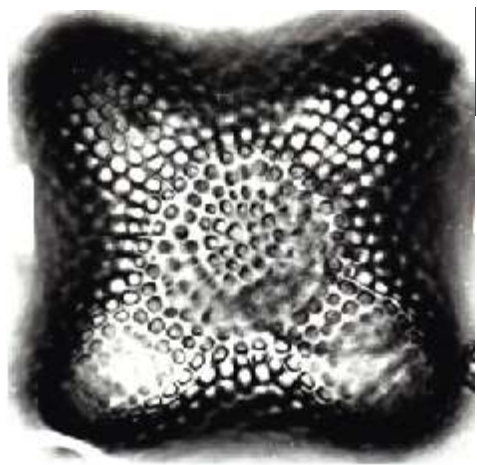


Figure 12-29: Paperwhite *Narcissus tazetta* from Zverneci Island (Photo. A. Miho).

The former true alluvial forests in the Vjosa delta, with elm (*Ulmus*), willows (*Salix*), white poplar (*Populus*), alder (*Alnus*) and ash (*Fraxinus*) have almost disappeared, only small populations of willows and white poplar remained in some limited areas. But they still contribute significantly to the biodiversity of the site. Parts of these forests have been damaged and changed to

a more shrubby appearance. At other sites typical hygrophilous communities prosper (Tab. 12-8).

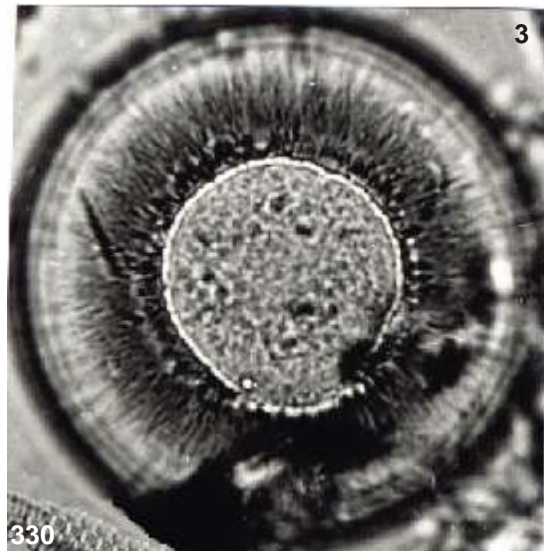
Scientific name	Common name	Albanian name	Remarks
<i>Phragmites australis</i>	Common reed	Kallamishte	most common
<i>Schoenoplectus lacustris</i> (= <i>Scirpus lacustris</i>)	Bulrush	Kryekuqi	
<i>Schoenoplectus maritimus</i> (= <i>Scirpus maritimus</i>)	Saltmarsh bulrush	Kryekuqi detar	
<i>Typha angustifolia</i>	Lesser bulrush, Narrowleaf cattail	Shavari, Rogozi gjethengushte	
<i>Typha latifolia</i>	Common bulrush, Broadleaf cattail	Shavari, Rogozi gjethegjere	
<i>Alnus glutinosa</i>	European alder	Verriu i zi	requent
<i>Platanus orientalis</i>	Oriental plane	Rrapi	
<i>Populus alba</i>	Silver poplar	Plepi i bardhe	
<i>Salix</i> spp.	Willow	Shelgje	
<i>Tamarix parviflora</i>	Smallflower tamarisk	Marina lulevogel	
<i>Ulmus minor</i>	Field elm	Vidhi	ygrophyllous
<i>Vitex agnus - castus</i>	Chaste tree	Konopica	
<i>Carex elata</i>	Tufted sedge swamp	Presja	
<i>Lemna</i> spp.	Common duckweed	Lemnati	
<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	Miriofilii si kalli	
<i>Nuphar lutea</i>	Yellow water-lily	Zambak i verdhe uji	
<i>Nymphaea alba</i>	European white waterlily, White lotus	Zambak i bardhe uji	
<i>Potamogeton</i> spp.	Pondweed	Potamogetone	
<i>Saccharum ravennae</i>	Ravenna grass	Bari i Ravenes	
<i>Schoenoplectus lacustris</i> (= <i>Scirpus lacustris</i>)	Bulrush	Kryekuqi	
<i>Sparganium erectum</i>	Branched bur -reed	Spargani i drejte	



1 - 2

1 and 3: 13.6 μm
2: 16.7 μm

4: 10 μm



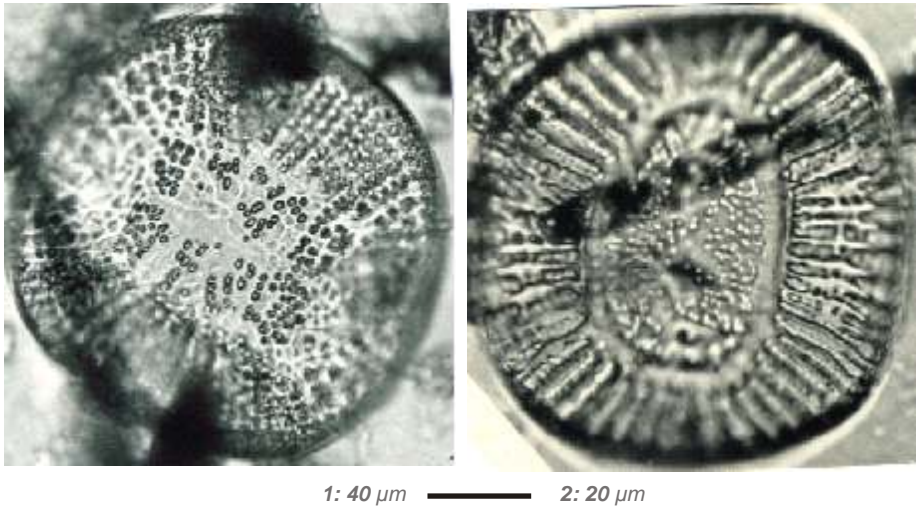


Figure 12-31: Diatoms from the Orikumi wetlands:
1: *Campylodiscus echeneis*; 2: *C. clypeus* (photos: A. Miho).

« « « **Figure 12-30:** Diatoms from the Orikumi wetlands: 1-2: *Amphitetras antedeluviana*;
3: *Hyalodiscus radiatus*; 4: *Entomoneis alata* (Photos: A. Miho).

Orikumi - Karaburuni: With a few random samplings of diatoms only in habitats of the Orikumi lagoon more than 70 taxa have been found (Miho *et al.*, 2012); some common and interesting taxa are depicted in figures 12-30 and 12-31. The phytoplankton structure seems similar to the one of the Butrinti, but with a lower cell density. Centric diatoms were the most abundant, dinoflagellates increased in summer. Even in Orikumi the centric diatom *Cyclotella choctawhatcheeana* (see Fig. 13-24) was common. Concerning the microflora as food base the lagoon could be a good site for shellfish production.

The bottom of the lagoon is again covered with *Zostera noltii* and *Ruppia cirrhosa*, often in pure associations or mixed with *Chaetomorpha linum*. Typical halophyte vegetation grows in limited littoral areas (Fig. 12-33); there we find *Arthrocnemum fruticosum*, *A. glaucum*, *Salicornia europaea*, *Juncus maritimus*, *Halimione portulacoides* and *Inula crithmoides*.



Figure 12-32: Ionian snowflake *Acis ionica* (*Leucojum jonicum*; *L. valentinum* ssp. *vlorense*) near the Marmiroi church in Orikumi (Photos: L. Kashta).



Figure 12-33: Plant communities with *Arthrocnemum* spp. In the Orikumi lagoon (Photo: L. Kashta).



Figure 12-34: *Above:* Orikumi wetland, Dukati plain, Çika mountain and Llogora Pass; *left:* Rreza brook; *below:* aquatic habitats in the lagoon, covered with reed beds with *Phragmites australis* and *Typha latifolia* (Photos: F. Bego and A. Miho).



In figure 12-34 different aquatic habitats are shown mainly covered with reed beds with *Phragmites australis* and *Typha latifolia*. On the rocky hills surrounding the lagoon *Acis ionica* (= *Leucojum joniceum*, *L. valentinum* ssp. *vlorense*), also a sub-endemic species of *Amaryllidaceae* is found (Fig. 12-32).

No data are available so far on the floral biodiversity of the former Orikumi wetland, but according to local people the adjoining area of the Dukati wetland was mainly covered with reed beds with *Phragmites australis* and *Typha latifolia* which encompass a core of an alluvial forest of Black alder (*Alnus glutinosa*), willows (*Salix* spp.), Narrow-leaved ash (*Fraxinus angustifolia*), Common hawthorn (*Crataegus monogyna*) and Bay laurel (*Laurus nobilis*). During the last two decades some renaturation started in parts of abandoned land close to the lagoon, but the state is far away from native.

The biodiversity in the marine water of the protected zone Karaburuni / Sazani with rare species and the littoral benthos developed a typical Mediterranean composition. It is characterized by a high abundance of Mediterranean-Atlantic species. Meadows of Neptune grass *Posidonia oceanica* grow at 6 to 10 m depth and often deeper in sheltered sites of the rocky coastline (see also Chapter 4). These are also present near the coast in shallow water on the eastern side of Sazani. In the western part of the zone, Neptune grass grows more on rocky substrates and rarely in sandy beds in front of the beach. Other plant communities of interest are dominated by the red alga *Lithophyllum byssoides* (see Fig. 4-5) and by species the brown alga *Cystoseira* (see Figs. 4-4 and 4-6). Meadows of *Posidonia* and other plant communities host many species of microscopic algae (diatoms), as well as animal species, including sponges, cnidarians, bryozoans, mollusks, annelids, crustaceans, echinoderms and ascidians. The mediolittoral coralline algae form a rim that extends locally to more than 1 m in width, mostly in the western part of Karaburuni.

Different vegetation types characterize the hilly slopes. The vegetation on the western side is well developed down to sea level, while it is more impacted by fires on the eastern slopes of the Rreza-Karaburuni, and forms a landscape of *maquis* with scarce pines and cypresses shaped by the wind.

Most interesting are the broadleaved evergreen forests still containing part of an original natural forest of Cypress and pines (*Pinus pinea* and *P. halepensis*). The best preserved forest in Albania with Valonia oak *Quercus macrolepis* (= *Q. ithaburensis* ssp. *macrolepis*) grows in this zone (Fig. 12-35).

Table 12-9: Plant community in Llogora - Karaburuni terrestrial protected areas (Kashta et al., 2010).		
Scientific name	Common name	Albanian name
<i>Abies borissi-regis</i> (in Llogara NP)	Macedonian fir	Bredhi bullgar
<i>Arum italicum</i>	Italian arum	Kelkaza
<i>Athamanta macedonica</i>	Bubon	Atamanta maqedonase
<i>Brachipodium ramosus</i>	Bunch grass	Rudithi i degezuar, Stupec
<i>Brassica incana</i>	Mediterranean mustard	Lakra e thinjur
<i>Brassica oleracea</i> ssp. <i>oleracea</i>	Wild cabbage	Lakra e bardhe e eger
<i>Buxus sempervirens</i> (in Llogara NP)	European box	Bushi
<i>Capparis spinosa</i>	Caper bush	Kapari gjembor
<i>Cupressus sempervirens</i>	Cypress	Selvia
<i>Daphnie gnidium</i>	Flax-leaved daphne	Xerxelja gnidium
<i>Desmazeria marina</i>		Desmazeria bregdetare
<i>Drimia maritima</i> (= <i>Urginea maritima</i> , <i>U. scilla</i> , <i>Scilla maritima</i>)	Sea squill	Boçka, Qepa e detit
<i>Ephedra distachya</i>	Sea-grape	Gjunjz
<i>Erica manipuliflora</i>	Heath	Hamuriqui
<i>Euphorbia dendroides</i>	Tree spurge	Qumeshtore si dru, Flomi
<i>Ilex aquifolium</i> (in Llogara NP)	Holly	Ashja
<i>Juniperus foetidissima</i> (in Llogara NP)	Foetid juniper	Venje e bardhe, Bershen
<i>Juniperus phoenicea</i>	Phoenicean juniper	Dellinja fenikase, Venje
<i>Laurus nobilis</i> (relict)	Laurel	Dafina
<i>Lotus cytisoides</i>	Grey bird's-foot trefoil	Thuapule si vjexhes
<i>Myrtus communis</i>	Common myrtle	Mersina
<i>Orchis</i> spp.	Orchids	Salepe te ndryshme
<i>Ori ganum vulgare</i>	Oregano	Rigoni i bardhe
<i>Phlomis fruticosa</i>	Jerusalem sage	Cfaka, Bexga
<i>Pinus halepensis</i>	Aleppo pine	Pisha e eger
<i>Pinus heldreichii</i> (in Llogara NP)	Bosnian pine	Rrobulli, Armeni
<i>Pinus nigra</i> (in Llogara NP)	Black pine	Pisha e zeze
<i>Pinus pinea</i>	Stone pine	Pisha e bute
<i>Pistacia lentiscus</i>	Mastic	Xina, Sqind, Bafra
<i>Prasium majus</i>	White hedge-nettle	Piperi i eger i madh
<i>Prunus webbii</i>	Wild almond tree	Bajame e eger
<i>Quercus coccifera</i>	Kermes oak	Prralli
<i>Quercus ilex</i>	Holly oak	Ilqe
<i>Quercus macrolepis</i> (= <i>Q. ithaburensis</i> ssp. <i>macrolepis</i>)	Valonia oak	Valanidhi
<i>Taxus baccata</i> (in Llogara NP)	Yew	Tisi



Figure 12-35: **Above:** Forest of Valonia oak (*Quercus macrolepis*, =*Q. ithaburensis* ssp. *macrolepis*) on the western slopes of Karaburun; **left:** inflorescence of Sea onion *Drimia maritima* (= *Urginea maritima*); **below:** *Erica manipuliflora* in flower, near to the Palasa beach (Photos: L. Kashta and A. Miho).





Figure 12-36: *Left:* Association with Jerusalem sage (*Phlomis fruticosa*) in the Rreza hills (Orikumi); *right:* fructification of *Arum italicum* in Karaburuni (Photos: A. Miho).

The most common trees in the Llogara forest are Black pine, Macedonian fir, and Bosnian pine, mixed also with mountain shrubs, such as European box, Yew, Holm oak, Foetid juniper and Holly. The plants dominating in these communities are listed in table 12-9. The crowns of the trees right on the Llogara Pass are wiped mainly by the strong south-eastern winds, known as *juga*. One of the Austrian pines, not far from the Pass, is called Flag Pine, a natural monument, about 100 years old, 25 m high and with 75 cm trunk diameter (Fig. 12-7). Pictures of plant species from the zone are given in figures 12-35 and 12-36.

Fauna

Vjosa - Narta: The Vlora Bay and the transitional wetlands around are known for a high fauna diversity. This is again caused by the variety of different environments, the sea, saline and brackish habitats, sandy dunes and the freshwater and alluvial habitats. About 198 endangered species are reported to inhabit these sites. This number is equal to nearly half of all the endangered animal species within the whole Albanian territory.

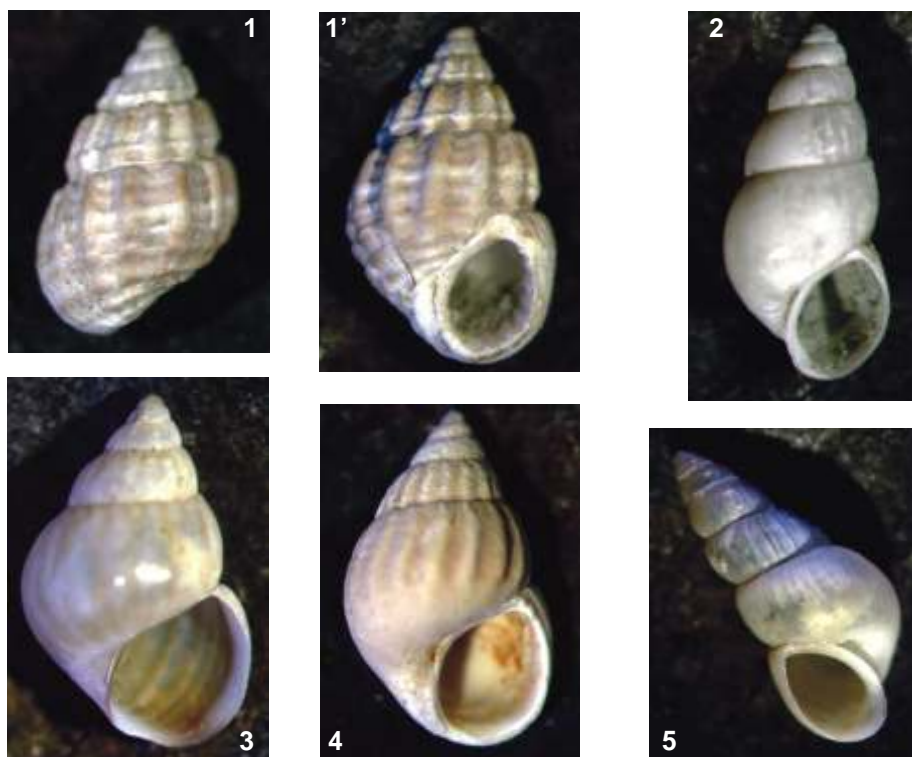


Figure 12-37: Mollusks (gastropodes) from the Narta zone: 1 and 1': *Alvania lineata*; 2: *Hydrobia acuta*; 3: *Pusillina lineolata*; 4: *P. radiata*; 5: *Ventrosia ventrosa*
(Photos: S. Beqiraj).

For the Narta lagoon about 32 mollusks are listed, most widespread are the gastropods *Hydrobia acuta*, *Ventrosia ventrosa*, *Pusillina marignata*, *Pirenella conica*, *Cyclope neritea* and the bivalves *Cerastoderma glaucum* and *Scrobicularia cottardi*. About 60 mollusk species have been reported for the coastal habitats of the Vjosa delta to the Narta wetlands (Tab. 12-10; Figs. 12-37 and 12-38); among them are 27 gastropods (snails), 29 bivalves (mussels) and 4 cephalopods (octopus, squids and cuttlefish). Out of these 42 species originate from marine habitats, 12 from freshwater and 6 from terrestrial sites.

Table 12-10: List of the most common species of mollusks, in the different habitats of the Vjosa-Narta zone (Beqiraj, 2001; 2004); L, lagoon; S, sea; F, freshwater; T, terrestrial.

Gastropods	Habitats	Gastropods	Habitats
<i>Alvania lineata</i>	L	<i>Natica stercusmuscarum</i>	S
<i>Aplysia punctata</i>	L, S	<i>Neverita josephinia</i>	S
<i>Aporrhais pespelecani</i>	S	<i>Physella acuta</i>	L, F
<i>Bithynia tentaculata</i>	F	<i>Pirenella conica</i>	L
<i>Bittium reticulatum</i>	L	<i>Planorbarius corneus</i>	F
<i>Bulla striata</i>	L, S	<i>Planorbis planorbis</i>	F
<i>Cepaea vindobonensis</i>	T	<i>Pomatia elegans</i>	T
<i>Cerithium rupestre</i>	L	<i>Pusillina diversa</i>	L
<i>Cerithium vulgatum</i>	L, S	<i>Pusillina lineolata</i>	L
<i>Cyclope neritea</i>	L, S	<i>Pusillina marginata</i>	L
<i>Eobania vermiculata</i>	T	<i>Pusillina radiata</i>	L
<i>Galba truncatula</i>	F	<i>Radix auricularia</i>	F
<i>Galeoda echinophora</i>	S	<i>Rissoa labiosa</i>	L
<i>Gibbula adriatica</i>	L	<i>Rissoa ventricosa</i>	L
<i>Haminoea hydatis</i>	L	<i>Sphaeronassa mutabilis</i>	L, S
<i>Haminoea navicula</i>	L	<i>Stagnicola corvus</i>	F
<i>Helix lucorum</i>	T	<i>Theba pisana</i>	T
<i>Hexaplex trunculus</i>	S	<i>Theodoxus fluviatilis</i>	F
<i>Hydrobia acuta</i>	L	<i>Tonna galea</i>	S
<i>Lymnaea stagnalis</i>	F	<i>Tricolia pullus</i>	L
<i>Monacha cartusiana</i>	T	<i>Turbonilla lactea</i>	L
<i>Murex brandaris</i>	S	<i>Turritella c ommunis</i>	S
<i>Nassarius incrassatus</i>	S	<i>Turritella turbona</i>	S
<i>Nassarius reticulatus</i>	L, S	<i>Ventrosia ventrosa</i>	L
<i>Natica hebraea</i>	S	<i>Viviparus contectus</i>	F
Bivalves			
<i>Acanthocardia ec hinata</i>	S	<i>Mactra corallina</i>	S
<i>Anodonta cygnaea</i>	F	<i>Mytilaster minimus</i>	L
<i>Anomia ephippium</i>	L	<i>Mytilus galloprovincialis</i>	L
<i>Callista chione</i>	S	<i>Paphia aurea</i>	L
<i>Cerastoderma glaucum</i>	L, S	<i>Pecten jacobaeus</i>	S
<i>Chamelea gallina</i>	S	<i>Pharus legumen</i>	S
<i>Chlamys glabra</i>	S	<i>Scrobicularia cottardi</i>	L
<i>Chlamys multistriata</i>	S	<i>Scrobicularia plana</i>	L, S
<i>Donax semistriatus</i>	S	<i>Solecurtus strigillatus</i>	S
<i>Donax trunculus</i>	S	<i>Solen marginatus</i>	L, S
<i>Dosinia lupinus</i>	L	<i>Tapes decussatus</i>	L, S
<i>Ensis minor</i>	S	<i>Tellina exigua</i>	S
<i>Glossus humanus</i>	S	<i>Tellina inca rnata</i>	S
<i>Glycymeris bimaculata</i>	S	<i>Tellina planata</i>	S
<i>Glycymeris glycymeris</i>	S	<i>Tellina pulchella</i>	S
<i>Glycymeris insubrica</i>	S	<i>Unio crassus</i>	F
<i>Laevicardium oblongum</i>	S	<i>Venus casina</i>	S
<i>Macoma cumana</i>	L		
Cephalopods			
<i>Loligo vulgaris</i>	S	<i>Sepia officinalis</i>	S
<i>Ozaena moschata</i>	S	<i>Sepietta oweniana</i>	S

Figure 12-38: Benthic sampling in the Narta lagoon (Photo: D. Kasemi).

Harvesting bivalves in the lagoon has strongly increased during the past 15 years, especially species of *Tellina*, *Donax* and *Solen* from coastal habitats and *Tapes decussatus* from within



the lagoon have been collected. This has certainly changed the mollusk composition and impacted other benthic populations. Recently, the presence of the invasive Blue crab *Callinectes sapidus* has been recorded at the Narta and Orikumi lagoon.

The river Vjosa and its delta as well as the lagoon of Narta are important for fish diversity in the region and are crucial for fishing and aquaculture. About 39 fish species have been recorded for the zone. The plain part the Vjosa river is populated mainly by cyprinids, in the upper mountainous part salmonids are more frequent. A register of the most frequent fish is given in table 12-11. The lagoon is used for fishing for a long time (Fig. 12-39), mainly by local people from the surrounding villages Narta and Zverneci. The economically most important fish species are listed in table 12-12. As fishing is hardly controlled by the local authority overfishing has caused a massive decrease in the fish population.



Figure 12-39: First connecting channel with fish traps (called by the locals *dajlani*) in the Narta lagoon (Photo: S. Beqiraj).

Table 12-11: Fish species in different zones of the Vjosa delta.

Scientific name	Common name	Albanian name	Remarks
<i>Barbus meridionalis</i> ssp. <i>rebeli</i>	Mediterranean barbel	Mrena e Ohrit, e Fanit	in the whole river
<i>Leuciscus cephalus</i> ssp. <i>albus</i>	Chub	Mlyshi	
<i>Barbatula barbatula</i> (= <i>Noemacheilus barbatulus</i> ssp. <i>sturanyi</i>)	Stone loach	Tufeza	
<i>Pachychilon pictum</i>	Albanian roach	Skorti i zi	In the upper section of the river
<i>Chondrostoma nasus</i> ssp. <i>nasus</i>	Common nase	Pendekuqi, Njila malore	
<i>Gobio gobio</i> ssp. <i>lepidolaemus</i>	Gudgeon	Barbuqi, Mustaku	
<i>Salmo trutta</i> ssp. <i>fario</i>	Brown trout	Trofta e murrme	
<i>Salmo trutta</i> ssp. <i>macrostigma</i>	Brown trout	Trofta e malit	
<i>Alburnus albidus</i> ssp. <i>alborella</i>	Italian bleak	Gjuca	in the plain part
<i>Cobitis taenia</i> ssp. <i>taenia</i>	Spined loach	Mrena e eger	
<i>Liza ramada</i>	Thinlip mullet	Qefulli i vjeshtes	
<i>Acipenser naccarii</i>	Adriatic sturgeon	Blini i Drinit, B. i bardhe, B. i Adriatikut	sea migratory fish
<i>Acipenser sturio</i>	Common sturgeon	Blini i Evropes Perendimore	
<i>Alosa fallax</i> ssp. <i>nilotica</i>	Twaite shad	Kubla	
<i>Anguilla anguilla</i>	European eel	Ngjala	
<i>Lampetra fluviatilis</i>	River lamprey	Kale lumi	
<i>Platichthys flesus</i> ssp. <i>luscus</i>	European flounder	Ushojza a zeze	
<i>Aphanius dispar</i>	Toothcarp	Çeliku laraman	
<i>Aphanius fasciatus</i>	Mediterranean killifish	Çeliku me rripa	
<i>Aphanius iberus</i>	Spanish toothcarp	Lareza iberike	
<i>Argyrosomus regius</i>	Shade-fish, stone basse	Ameja, Orli i detit	
<i>Arnoglossus laterna</i>	Scaldfish	Gjuheza gojemadhe	sea or littoral sea water fish
<i>Atherina hepsetus</i>	Mediterranean sand smelt	Aterina, Terina, Gavoni	
<i>Boops boops</i>	Bogue	Vopa, Tonovili	
<i>Dicentrarchus labrax</i>	European sea bass	Levrek	
<i>Diplodus annularis</i>	Annular sea bream	Sargu, Spari bishtzi	
<i>Diplodus sargus</i> ssp. <i>sargus</i>	White sea bream	Sargu i zakonshëm, i bardhe	
<i>Diplodus vulgaris</i>	Banded sea bream	Sargu me dy shirita	
<i>Lebistes reticulatus</i>	Guppy	Lareza tripikaloshe	
<i>Lepidorhombus whiffiagonis</i>	Megrin	Rombi i ashper verdhacak	
<i>Lichia amia</i>	Garrick	Lojba, Lica, Glica	
<i>Liza ramada</i>	Thin lip mullet	Qefulli i vjeshtes	
<i>Mugil cephalus</i>	Flathead grey mullet	Qefulli i veres	
<i>Pagrus pagrus</i>	Red porgy	Pagri i zakonshem	
<i>Sciaena umbra</i>	Brown meagre	Korbi i zi	
<i>Scophthalmus rhombus</i>	Brill	Rombi i lemuar	
<i>Seriola dumerili</i>	Greater amberjack	Gofa	
<i>Sparus aurata</i>	Gilthead seabream	Kocja, Ullorja	
<i>Sporpaena porcus</i>	Greater amberjack	Shkerpi	
<i>Trachinotus ovatus</i>	Pompanos	Lojba me pika	
<i>Trachinus draco</i>	Er weever	Dreqi i detit	
<i>Umbrina cirrosa</i>	Shi drum	Korbi i bardhe	

Table 12 -12: Economic important fish species in Narta (N) and Orikumi (O) lagoons.				
Scientific name	Common name	Albanian name	Status	Location
Harvested fish species				
<i>Anguilla anguilla</i>	European eel	Ngjala	migrating, economically important	N, O
<i>Aphanius</i> spp.	Toothcarp	Çeliku	restricted to the western part	N
<i>Atherina boyeri</i>	Big-scale sand smelt	Aterina symadhe	amounts for about 30% of the fish production	
<i>Atherina hepsetus</i>	Mediterranean sand smelt	Aterina, Terina, Gavoni	amounts for about 30% of the fish production	
<i>Chelon labrosus</i>	Thicklip grey mullet	Qefulli i dimrit		N, O
<i>Dicentrarchus labrax</i>	European sea bass	Levreku	voracious	
<i>Dicentrarchus punctatus</i>	Stotted sea bass	Levreku pikalosh		N
<i>Diplodus annularis</i>	Annular sea bream	Sargu bishtzi	endangered	
<i>Diplodus sargus</i>	White sea bream	Sargu i zakonshem	endangered	
<i>Diplodus vulgaris</i>	Bonded sea bream	Sargu me dy shirita te zi	endangered	
<i>Lebistes</i> spp.	Guppy	Lareza	restricted to the western part	
<i>Lithognathus mormyrus</i>	Stripped sea bream	Murra me rripa	endangered	
<i>Liza ramada</i>	Thin lip mullet	Qefulli i vjeshtes	economically important	
<i>Liza saliens</i>	Leaping mullet	Gasturi		
<i>Mugil cephalus</i>	Flathead grey mullet	Qefulli i veres		N, O
<i>Oblada melanura</i>	Saddled sea bream	Melanura	endangered	
<i>Raja clavata</i>	Thornback ray	Ragja, Raja		N
<i>Solea solea</i>	Common sole	Gjuheza		
<i>Sparus aurata</i>	Gilthead seabream	Kocja	indicates masses of mollusks	N, O
Harvested invertebrates				
<i>Carcinus mediterraneus</i>	Common littoral crab	Gerthia		N
<i>Sepia officinalis</i>	Common cuttlefish	Sepja		

More than 150 species of winged insects (*Pterygota*) have been collected from different aquatic and terrestrial habitats in the Vjosa-Narta zone, they are spread among *Lepidoptera* (63 species), *Coleoptera* (43), *Odonata* (8) and *Orthoptera* (7). Some of these may be harmful to both agricultural cultures and natural vegetation; these are listed in table 12-13. The biological equilibrium becomes occasionally displaced by the development of massive blooms, even of endangered species with multi annual dynamics, like night butterflies with *Thaumetopoea pityocampa*, *Hyphantria cunea* and *Malcosoma neustria*.

Table 12-13: Insects endangering both agricultural cultures and natural vegetation.			
Scientific name	Common name	Albanian name	Remarks
Coleopters			
<i>Anisoplia agrico la</i>		Anisoplia me kryq	pest of cereal crops
<i>Anisoplia austriaca</i>	Wheat grain beetle	Buburreci austriak, Zhuzhaku i drithrave	pest of cereal crops
<i>Anomala vitis</i>	Vine chafer	Brumbulli i gjelber, Zhuzhaku i hardhise	pest of fruit trees
<i>Cetonia aurata</i>	Rose chafer	Zhuzhaku i arte	
<i>Epicometis hirta</i>	Apple blossom beetle	Buburreci, Zhuzhaku lulengrenes leshtak	pest of fruit trees
<i>Oxythyrea funesta</i>	White-spotted rose beetle	Buburreci lulengrenes	grapevine, wheat
Lepidopters			
<i>Cossus cossus</i>	Goat moth	Moli i dhive	pest of fruit trees
<i>Hyphantria cunea</i>	Fall webworm	Krimb rrjetor vjeshtor	may form blooms
<i>Malacosoma neustria</i>	Lackey moth	Flutra servile	may form blooms
<i>Odonestis pruni</i>	Plum lappet	Flutra e kumbullave	pest of fruit trees
<i>Papilio machaon</i>	Old world swallowtail	Flutura bajrake	
<i>Thaumetopoea pityocampa</i>	Pine processionary	Flutura procesionaria	may form blooms
<i>Zeuzera pyrina</i>	Wood leopard moth	Flutra leopard e drurit	pest of fruit trees



Figure 12-40: European terrapin (*Emys orbicularis*) from Narta area (Photo: I. Haxhiu).

About 9 species of amphibians and 26 species of reptiles have been described for the Narta zone (Fig. 12-40). The two amphibians *Rana balcanica* and *R. lessonae* are of economical interest as in other

wetlands in Albania. At Mifoli, green frogs are collected, processed and exported since 30 years. About 23'000 tones of frogs have been harvested during the last 10 years.

The Narta area is listed as the second most significant site for water birds in Albania after the Karavasta area (Figs. 12-41 to 12-43). About 80 species have been recorded. More than 90% of them prefer the less disturbed central part of the lagoon. Ducks (*Anas* sp.) and coot (*Fulica atra*) are most abundant with 47% equal to 18'000 individuals and 35% with 13'500 individuals, respectively. The lagoon is known as the main wintering site in Albania for many birds (Tab. 12-14).

Table 12-14: Wintering birds in the Narta lagoon.

Scientific name	Common name	Albanian name	Remarks
<i>Anas acuta</i>	Pintail	Rosa bishtgjele	
<i>Bucephala clangula</i>	Golden eye	Rosa me kater sy	
<i>Charadrius alexandrinus</i>	Kentish	Vrapuesi gushebardhe	
<i>Larus audouinii</i>	Audouini's gull	Pulebardha e Odoinit	globally endangered
<i>Numenius tenuirostris</i>	Slender-billed curlew	Kojliku sqepholle	globally threatened
<i>Pelecanus crispus</i>	Dalmatian pelican	Pelikani kaçurrel	globally endangered
<i>Phoenicopterus ruber</i>	Flamingo	Flamingo i kuq	
<i>Pluvialis squatarola</i>	Golden plover	Gjeleza pikaloshe	
<i>Tadorna tadorna</i>	Shelduck	Laroshja, Shota	



Figure 12-41: Birdfauna in Narta: **above:** gulls (*Larus* spp.); **right:** Eurasian spoonbill (*Platalea leucorodia*); **below:** Little egret (*Egretta garzetta*) (Photos: F. Bego).



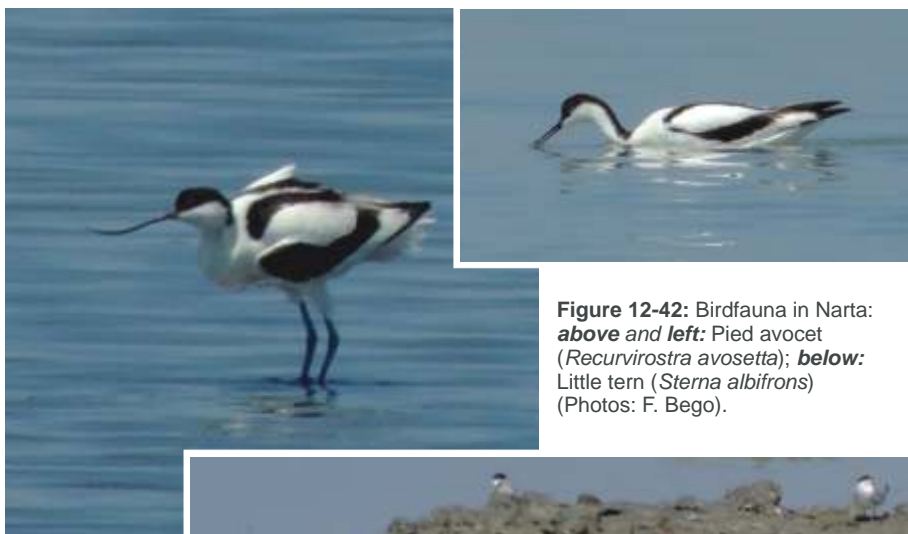


Figure 12-42: Birdfauna in Narta: **above and left:** Pied avocet (*Recurvirostra avosetta*); **below:** Little tern (*Sterna albifrons*) (Photos: F. Bego).





Figure 12-43: Birdfauna in Narta: Greater flamingo (*Phoenicopterus ruber*) (Photos: F. Bego).

Between 1950 and 1970 more than hundred couples of the Dalmatian pelican lived in the zone, today pelicans are rather rare. The saltern also seems to disturb the optimal environmental conditions in the lagoon system.

Orikumi - Karaburuni: The Orikumi lagoon is well known as a rich habitat for fish, principal species are listed in table 12-12. Four main fish species are catch: *Sparus aurata*, *Mugil cephalus*, *Anguilla anguilla* and *Dicentrarchus labrax*; the reported annual fish catch is about 10 t (Fig. 12-44).

Professional fishing exists along the coast of Rreza-Karaburuni and Sazani. The fish fauna of commercial interest consists of some demersal groups (living on or near the bottom of the sea), with harvests of small and large fish, crustaceans and mollusks. Uncontrolled fishing and hunting by individuals still continue in the zone.

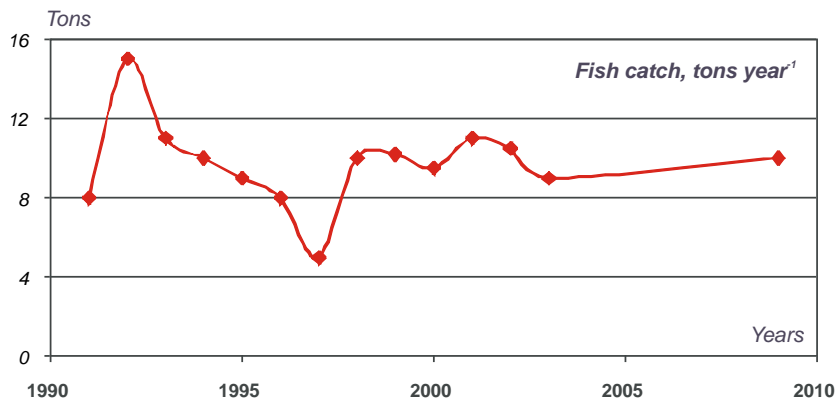


Figure 12-44: Yield of fish catch (tones) from the Orikumi lagoon between 1991 and 2003
(Anonymous, 2006b; <http://www.albaniandf.org/Resources/Publikime/>).



Figure12-45: Bird watching in the Orikumi wetlands by the master students of Environmental Biology 2012, FNS, UT (Photo: O. Nika).



Table 12-46: Fauna in Orikumi:
1: examining a Grass snake (*Natrix natrix*); 2: Greek march frog (*Pelophylax kurtmuelleri*, = *Rana kurtmuelleri*, *R. balcanica*); 3: the European terrapin (*Emys orbicularis*); 4: Hermann's tortoise (*Testudo hermanni*); 5: chicks of Barn swallow (*Hirundo rustica*), common during spring summer in the Orikumi area (Photos: I. Haxhiu, A. Miho and O. Nika).

The Gilt-head (sea) bream (*Sparus aurata*) and the Mediterranean mussel (*Mytilus galloprovincialis*) were both abundant in the lagoon before 1970; their number declined mainly due to the poor water exchange with the sea.

Recently some aquaculture has been developed in the littoral zone along the eastern part of Karaburuni, the Gilt-head seabream and the European seabass are raised in sea cages (see Fig. 4-20). Professional fishing is based mainly on lines and trawling. But uncontrolled fishing and hunting is still frequent in the zone.

Bivalves are also economically important. Mainly the Grooved carpet shell (*Ruditapes decussatus*) and the Golden carpet shell (*Venerupis aurea*) propagate on gravel substrate near the channels to the sea. Both species are in high demand on the market; as a consequence their incidence in nature has decreased. The annual mollusk yield in the lagoon is estimated 1.5 to 2 t. Shells, like the European date mussel (*Lithophaga lithophaga*) are frequently but illegally harvested along the rocky coastline in Karaburuni.

The Red coral (*Corallium rubrum*, see Fig. 4-15), European date mussel (*Lithophaga lithophaga*), Purple starfish (*Ophidiaster ophidianus*, see Fig. 4-13), Solitary dusky grouper (*Epinephelus marginatus*) and several species of sponges are of interest in the marine protected area of Karaburuni - Sazani.

About 10 species of amphibians and 20 reptiles have been mentioned for the whole zone in the Orikumi-Llogora-Karaburuni region (Fig. 12-46). Three globally endangered sea turtles are present, the Loggerhead turtle (*Caretta caretta*), the Green turtle (*Chelonia mydas*), and the rare Leatherback turtle (*Dermochelys coriacea*).

Moreover, several species of cetaceans are reported in Karaburuni and Vlora bay, such as the Shortbeaked common dolphin (*Delphinus delphis*) and the Common bottlenose dolphin (*Tursiops truncatus*), considered endangered in the Mediterranean (see also Chapter 4). The Mediterranean monk seal (*Monachus monachus*) has also been sighted in the Karaburuni waters.



Figure 12-47: The Orikumi beach and the Karaburun peninsula mountain chain (*above*) and Radhima village (*below*) (Photos: A. Miho).

About 105 species of birds have been counted; more than 60 are resident in the zone, proving again the importance of the wetlands for waterbirds (Fig. 12-45). The rocky sites in Karaburuni, in particular the high cliffs, are perfect for nesting pelagic seabirds (i.e. species of *Laridae*); among birds of prey the most often seen are the Egyptian vulture (*Neophron percnopterus*) and the Peregrine falcon (*Falco peregrinus*).

More than 40 species of terrestrial mammals have been enlisted in the zone. The freshwater wetlands of the Orikumi lagoon become visited by the Wild boar, which was abundant in the Karaburuni forests. Its population became drastically reduced after the start of the land reclaiming and its decay was accelerated further by the illegal hunting. Due to the lack of control and the missing legal enforcement illegal hunting in the last several years caused a remarkable decline of its stock. European otter is reported as well for the wetlands of the zone.



Figure 12-48: Sunset at the Cold Water Riviera, Vlorë (Photo: E. Hamzaraj).